PNEUMOCOCCUS PERITONITIS.

A REPORT OF FIVE CASES.

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DURING the early part of the year 1901 there came under the writer's observation three cases of pneumococcus peritonitis. These formed the basis of a short paper read before the Roosevelt Hospital Alumni. This paper was not printed. Since then two other cases have been seen, all five occurring in the medical or surgical wards of St. Mary's Free Hospital for Children.

During the past year two excellent articles have appeared in German publications dealing with the subject of pneumococcus peritonitis. The one by Jensen (*Archiv für klinische Chirurgie,* 1903, lxx, p. 91), of Copenhagen, gives the histories of 106 cases, and to the article are appended 134 references to literature. The article by von Brüns (*Beiträge zur klinische Chirurgie,* 1903, xxix, p. 57), of Tübingen, was briefly reviewed in the December, 1903, number of this Journal.

In general, these articles are in accord, and many of their statements are borne out by findings in the five cases to be reported. Points to be especially noted in our cases will be presented after the histories of the cases.

In symptoms, course, pathological anatomy, and prognosis, pneumococcus peritonitis differs considerably from other types of peritonitis. A knowledge of these characteristic features of the disease will considerably aid one in making a diagnosis. The following description of the disease is largely borrowed from the articles of Jensen and von Brüns.

Frequency.—It is rare as compared to other pneumococcus infections. Netter, in 104 pneumococcus infections of adults, found no case of peritonitis, and in forty-seven such infections in children found it once. Moreover, among 140 cases of peritonitis bacteriologically examined he found the pneumococcus but twice. This is the more remarkable when it is added by Netter that in autopsies on pneumococcus pneumonias he was regularly able to demonstrate the pneumococcus in cover-slip preparations from the peritoneum. Flexner and others have confirmed this observation. Jensen records 106 cases of pneumococcus peritonitis. Several observers have seen from five to eight cases each. This would suggest to us that the disease is more frequent than hitherto supposed or than would be indicated by the total of 106 cases.

Age.—It is perhaps three times as frequent in children as in adults.

Sex.—Under fifteen years of age it is seven times as frequent in girls as boys. The two sexes are equally affected in adult life.

Mixed infection is infrequent, but has occurred when the disease has been the result of intestinal processes, as appendicitis and gastric ulcer.

Pathological Anatomy.—To one familiar with pneumococcus empyema very little need be said. There is a very fibrinous exudate without odor, of greenish yellow color. The consistency varies as in empyema; in one case the exudate is practically solid, in another quite fluid, with perhaps large masses of fibrin. One to four litres of pus have been evacuated in reported cases.

Localization.—There is a decided tendency for the process to become localized in the pelvis and hypogastrium, forming there a large, thick-walled abscess. There are other cases in which the process is diffuse, covering every spot of peritoneum with thick fibrinous exudate.

Termination.—A considerable number of cases have been discovered at autopsy; a number have ruptured through the abdominal wall at the umbilicus, one has discharged through the vagina. A large percentage of the incisions for hypogastric abscess have resulted in cures.

Associated Lesions.—Among these the most frequently observed are empyema, pneumonia, pericarditis, otitis media, and intestinal lesions. Salpingitis has been noted a few times in adults. In the majority of cases reported the peritonitis has appeared primary. There has been no history of pneumonia, nor has pneumonia, as a rule, been present at autopsy. In a few cases a pneumonia has followed the peritonitis.

Symptoms.—The most characteristic clinical picture is seen in the apparently primary cases, and three stages may readily be distinguished:

1. Sudden onset with high fever, vomiting for a day or two, tenderness and distention. There is little muscular rigidity, and the pain and distention are not so marked as in the other types of peritonitis.

2. After a few days vomiting ceases, temperature falls often to normal. Diarrhœa, often present in the first stage of the disease, is the rule in the second stage. The amelioration of symptoms is pronounced, appetite returns, and the child looks better.

3. Then with the increase of exudate there appears a tense cystic mass in the hypogastrium, temperature rises, and shows marked morning and evening remissions and exacerbations. There is cachexia and weakness, and the case terminates in from one to four months in death from exhaustion or in recovery following operation or perforation at the umbilicus.

Prognosis.—This is one of the less virulent types of peritonitis, since there is such a pronounced tendency to the localization of the process by the abundant fibrinous exudate thus forming one or more abscesses. As already mentioned, there are two types of the disease,—the diffuse, which may be expected to result fatally unless future experience shows that cases can be headed off by early operation, and the localized, which usually results fatally, unless operation is undertaken.

But when the localized form is operated upon, 80 per cent. of cases may be expected to recover. This high percentage of recovery has been obtained in cases operated upon from seventeen days to four months from the beginning of illness and in presence of one to four litres of pus.

Differential Diagnosis.—The late stages of the disease simulate tubercular peritonitis. In the second stage with diarrhœa and slight distention the picture is not unlike that of typhoid. In the early stage one may question whether a peritonitis exists at all, since distention and pain are not necessarily marked, and the bowels move readily with cathartics. The question of peritonitis secondary to appendicitis will arise, and in some cases the appendix has been the source of infection. The acute stage passing into one of falling temperature with localization of symptoms in the pelvis may simulate gonorrhœal peritonitis.

Etiology.—Following Jensen, we may recognize the following methods of infection:

1. Through a wound. One such case is reported following a hernia operation.

2. Through the diaphragm. This may be either an actual extension of inflammation from the thorax through the tissues of the diaphragm or a transportation of bacteria by the lymphatics from the thorax to the abdomen. This can undoubtedly occur, even though it involves a retrograde transportation, that is, a turning about of the usual lymph current, which is from peritoneum to thorax.

3. Through the genitals. The greater frequency of the affection in girls naturally has suggested the genitals as a portal of entry. However, there is no other proof of it than this single fact. Further, pneumococcus tubal infections are very rare, and have only been observed in adults. Moreover, in adult life males are as often affected as females. We must admit that there is at present no satisfactory explanation of the much greater frequency of the disease in girls.

4. Through the intestinal tract. Flexner was the first to report a pneumococcus peritonitis secondary to intestinal ulceration. It has also followed ulcer of the stomach.

5. Through the blood. Pneumococci are often found in the blood in pneumonia, and from this source bone and joint

infection may occur. In the same way in a pneumococcus septicæmia peritonitis may appear as a terminal inflammation.

6. From pneumococcic foci in the abdominal organs.

The depositing of the cocci in the peritoneum is not alone enough, however, to cause the peritonitis, as is shown by the frequent presence of the germs in cases of pneumonia in the peritoneum without a peritonitis. Some predisposing factor must be assumed.

CASE I.—*Empyema, Meningitis (?), Peritonitis, no Pneumonia.*

E. B., aged three years, female. Patient has been sick several days. Symptoms same as those on admission, *i.e.*, fever, extreme restlessness, abdominal pain, and constipation. There was moderate distention of abdomen and right thigh was slightly flexed. The mental condition was striking; the child would lie still for a few moments with eyes closed, but the slightest touch upon the skin, as, for instance, to feel pulse, would cause her to cry out and pull away her hand. The abdomen, though distended, was not more sensitive to touch than other parts of the body, and the distention was largely relieved by enema. The forepart of the chest, which alone was examined, revealed nothing. The diagnosis seemed to lie between peritonitis of unknown origin and meningitis. After admission, the bowels moved well as the result of an enema. Though there were no focal symptoms of meningitis, the peculiar cry and hyperæsthesia were suggestive of it. She was kept under observation twenty-four hours, and then, though diagnosis was no clearer, it was thought better to explore the abdomen. Accordingly, under ether, the writer made a one and one-half inch abdominal incision. Coils of intestine were distended and of a bluish color, but there was neither pus, fibrin, nor fluid of any kind in the abdomen. The wound was closed. Patient rapidly recovered from ether, and shortly afterwards began to emit short, sharp cries at intervals. Temperature ranged from 101.5° to 103.5° F. For two days following operation there was drowsiness, at times restlessness. She took fluids well and never vomited. She died two and a half days after exploration.

Autopsy revealed small empyema behind lower part of left lung; there was not more than an ounce of pus. Hypostatic congestion, but no consolidation of lungs. There was a peritonitis of the hypogastric region and pelvis; stomach and liver not involved. There was little fluid anywhere, but intestines were glued together by a yellow fibrinopurulent material. The wound showed no gross evidence of infection.

Diplococci with capsules were stained in pleural and peritoneal pus. Cultures were made on Loeffler's serum, and gave an abundant growth of diplococci apparently in pure culture.

CASE II.—*Empyema, Peritonitis, no Pneumonia.*

W. S., aged two and one-half years, male. Admitted to hospital October 5, 1901. The illness, which has extended over eight weeks, has been characterized by chills, fever, and cough. Pneumonia of right lung diagnosed before admission. Temperature on October 6, 101° F.

October 7 transferred to Dr. Charles N. Dowd's service. Portion of eighth rib on right side resected by Dr. Munger, the House Surgeon. Sixteen ounces of pus evacuated. Temperature normal for next three succeeding days; from the fourth to seventh day after operation it ranged from 99° to 104° F. Abdominal distention gradually appeared, and there was vomiting during the last twenty-four hours of life. Patient died seven days after operation.

Autopsy showed no pneumonia. Right lung adherent to chest wall in front and behind. Empyema cavity extends from apex of lung to diaphragm. There was no retention of pus. Diaphragm intact. The abdominal cavity contained thick yellow pus not uniformly distributed, but found chiefly along ascending colon, under surface of liver and in pelvis. Microscopical examination of thoracic and peritoneal pus by Welch's method of staining revealed the pneumococcus.

Dr. Dowd states that in this case during life the child showed great prostration and the large abdomen of rickets, yet there was no tense abdominal distention, severe pain, or flexion of the thighs.

CASE III.—*Empyema, Suppurative Pericarditis, Peritonitis, Pneumonia.*

J. R., aged three years, male. Admitted to hospital service of Dr. Swift May 2, and died May 5, 1901. Illness of two weeks' duration. Temperature on admission, 102° F. There was pallor, abdominal distention and flatness over posterior part of right chest. Bronchial voice and breathing over both lungs.

Temperature ranged from 102° to 105° F., and patient died in convulsions.

Autopsy showed two ounces of pus in right chest, lower part of left lung adherent and consolidated.

Three ounces of thick yellow pus in the pericardium.

There was a general peritonitis with moderate amount of fluid. The process was most marked on the upper surface of the liver. Coils of gut adherent. Pelvis contained straw-colored fluid. Pneumococci found in pleural and peritoneal pus, not sought in pericardial pus.

Dr. Dowd recorded that before death the child gave no evidence of peritonitis except pain. He frequently put his hand to the abdomen. Bowels moved regularly, abdomen was soft, and not so tender that touch elicited marked pain.

CASE IV.—*Empyema, Diffuse Peritonitis, no Pneumonia.*

M. D., aged five years, female. Admitted to hospital, June 3, 1903, with physical signs of empyema of right chest.

June 4. Operation by House Surgeon, Dr. Lewis. Portion of rib removed and a pint of pus evacuated.

June 6. Vomiting.

June 7. Rise of temperature, abdomen distended and tender. Enema effectual.

June 9. Temperature normal.

June 14. Abdomen is less tense, but there is still tenderness on palpation. The bowels are loose.

June 15. Died.

Autopsy.—Abdomen not distended. All abdominal viscera covered with and agglutinated by a thick, greenish yellow, nearly solid exudate. The only portion of peritoneum not thus covered was the upper surface of the left lobe of the liver. The lining of the empyema cavity gangrenous. Cavity perfectly drained. Lungs show slight hypostatic congestion. The muscular tissue of the diaphragm appears not involved, although peritoneum below and pleura above it are.

CASE V.—*Pneumonia, Peritonitis.*

J. K., aged three years, male. Admitted April 25, 1904, to the service of Dr. Swift. The child has been sick for two weeks with cough, fever, pain in the abdomen, and nose-bleed. Child is anæmic. Examination of chest and abdomen negative.

May 1. Marked dyspnœa and restlessness. Dulness over middle and lower lobe of right lung. Pain in the abdomen, vomiting, and constipation. Bowels moved with enema. Abdomen tender.

May 2. Urine contained abundance of albumen, granular and hyaline casts.

May 3. Leucocyte count, 40,000.

May 5. Died.

Autopsy.—Left lung shows slight hypostatic pneumonia. Nearly the whole of the right lung is covered with yellowish fibrin. There is a gray hepatization of the greater part of the middle lobe and a red hepatization of part of the lower lobe. Right heart enormously distended.

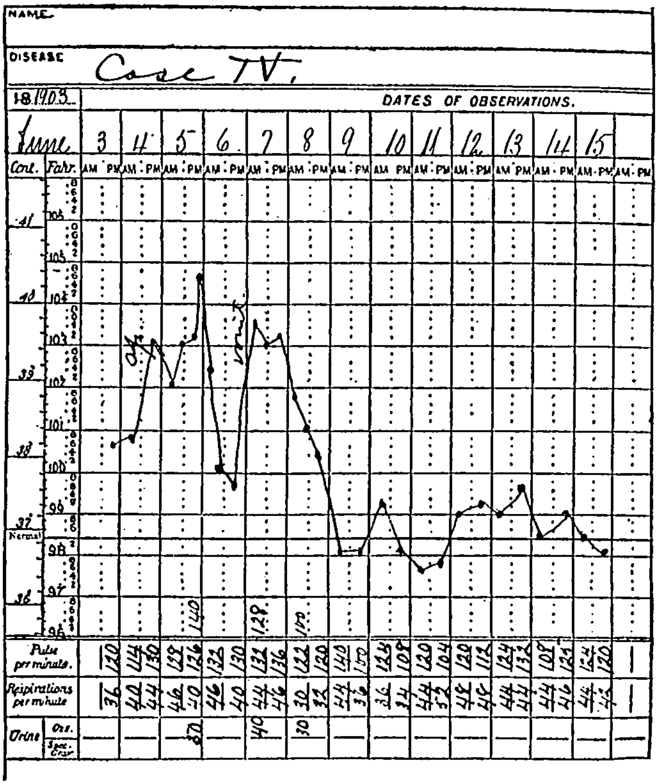
Peritoneum through most of the abdomen shows no change. The true pelvis is filled with rather thin fibrinous exudate. Fibrinous exudate also surrounds the caput coli and lower part of descending colon. No peritonitis around stomach, liver, or diaphragm. Colon empty and contracted, small intestine moderately distended.

This patient upon admission was not thought very sick. Evidently both pneumonia and peritonitis developed in the hospital. It is not unlikely that they were sequent to a nasopharyngitis, which had given him fever, cough, and nose-bleed before admission.

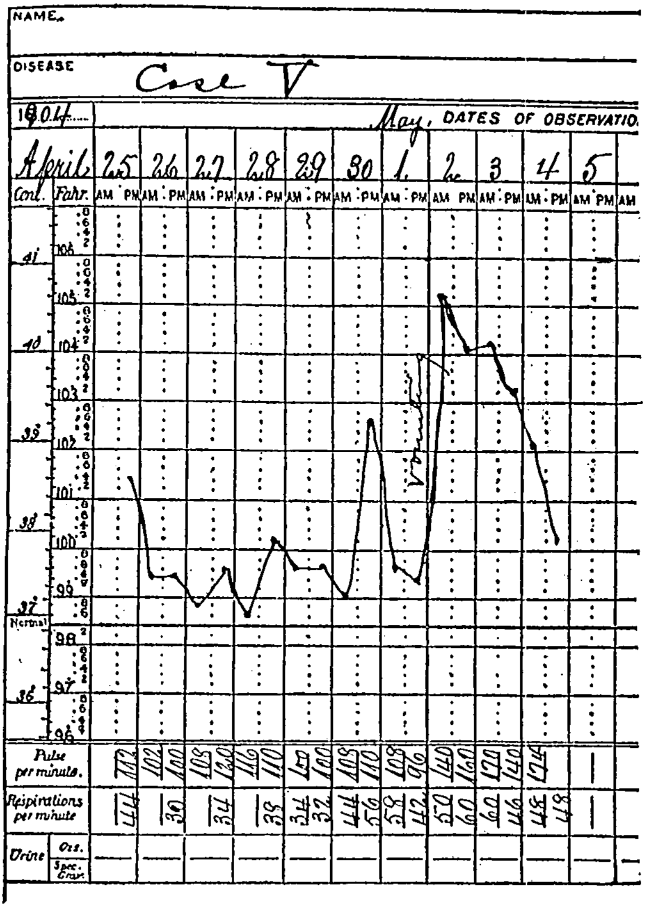
Pneumococci were found in the peritoneal exudate.

The autopsies in all the cases were made by the writer, as was also the bacteriological examination. Cover-slips were stained by Welch's method and cultures made on Loeffler's tubes.

Comments.—Among the patients were three boys and two girls. The ages were three, three, two and a half, five, and three years. Some variety is shown in the distribution of the peritonitis; once the whole peritoneum was involved, twice chiefly the region of stomach and liver, and twice the hypogastric region. In no case did the patient live to form a localized abscess. All the cases would seem to belong to the diffuse or spreading type of the disease. Four of the patients had empyema. In two the peritonitis followed the empyema, but in another two there is evidence that the process originated at about the same time in the pleura and peritoneum. At the time of death in these two cases there was but one or two ounces of pus in the pleura. Pericarditis was present once.



Writers have called attention to the rather small percentage of the cases of this type of peritonitis which are associated with pneumonia. This might mean that the primary infection was intestinal or otitic, or that the pneumonia had resolved at the time when peritonitis was diagnosed. Two of our cases had pneumonia at the time of death.



The deaths in all our cases, except Case IV, have occurred during the first stage of the disease, *i.e.*, the stage of high temperature. In Case IV the death occurred in the second stage, when the temperature had been practically normal for a week. (See temperature chart.)

Case V shows the steady decline of temperature after the acute onset.

The condition of the bowels in pneumococcus peritonitis strikes one as most unusual. There has been diarrhœa in a large percentage of the reported cases. In four of our cases the condition of the bowels is noted. Case IV had diarrhœa in the second stage of the disease. In Case V the bowels moved satisfactorily with cathartics and enema, and at autopsy the whole length of the colon was found empty and contracted. In Case III the history says bowels moved regularly. Case I was said to have been constipated, but in the hospital the bowels moved as the result of cathartics and enema.

The distention has been much less than in peritonitis or other bacteriology. In no case was there great distention. The histories contain such statements as "abdomen moderately distended," "the abdomen of rickets," "distention relieved by enema," "abdomen not distended."

There has been evidence of pain in all cases, either by the child putting its hand to the abdomen or tenderness to pressure. Flexion of thighs is but once noted.

As to etiology, we can say little definitely. There is no reason to think any case due to intestinal infection. As there has been empyema in four cases and pneumonia in the fifth, it would seem likely that all cases were primarily infections of the respiratory tract.

It is not difficult to understand the fatal termination of these cases when one recalls the multiplicity of lesions, as, for instance, empyema, pericarditis, and peritonitis or empyema, peritonitis and probable meningitis. When we class pneumococcus peritonitis among the less virulent types, we must remember that the cures have been chiefly in cases where peritonitis was apparently primary, and where operation was not undertaken for a generalized process, but for a localized abscess anywhere from two weeks to several months from the beginning of illness. The mortality will always no doubt be high where there are many pneumococcus lesions, and especially where, as seems likely in some of our cases, the peritonitis is part of a pneumococcus septicæmia.

One will be aided in the diagnosis of pneumococcus peritonitis in the presence of infections of the respiratory tract, if he places most reliance upon abdominal pain and tenderness. One must not rule out peritonitis, because, after the acute onset, temperature begins to subside or the patient seems better.

Peritonitis must be kept in mind so long as there is abdominal pain and tenderness, even though temperature is normal, bowels move regularly, and there is little or no distention.